US009094758B2

(12) **United States Patent**
Lee et al.

(10) **Patent No.: US 9,094,758 B2**
(45) **Date of Patent: Jul. 28, 2015**

(54) **AUDIO TRANSMISSION LINE AND HEADSET**

(75) Inventors: **Yu-Lung Lee**, New Taipei (TW); **Po-Hua Hsu**, New Taipei (TW)

(73) Assignee: **POWERTECH INDUSTRIAL CO., LTD.**, New Taipei (TW)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 625 days.

(21) Appl. No.: **13/471,187**

(22) Filed: **May 14, 2012**

(65) **Prior Publication Data**

US 2013/0170663 A1 Jul. 4, 2013

(30) **Foreign Application Priority Data**

Dec. 30, 2011 (TW) ..... 100149788 A

(51) **Int. Cl.**
H04R 1/10 (2006.01)
H04R 3/00 (2006.01)

(52) **U.S. Cl.**
CPC ***H04R 1/1041*** (2013.01); ***H04R 3/00*** (2013.01)

(58) **Field of Classification Search**
USPC 381/74, 77, 80–81, 111, 122, 123, 309, 381/370; 439/668, 675, 669, 108, 339
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,848,947	B2 *	2/2005	Chimiak	439/638
6,979,231	B2	12/2005	Shinohara	
7,618,294	B1	11/2009	Lin et al.	
7,654,315	B2	2/2010	Du et al.	
2002/0002061	A1 *	1/2002	Miyasaka et al.	455/557
2004/0151330	A1 *	8/2004	Lehmkuhl	381/123
2004/0213418	A1 *	10/2004	Chen	381/77
2005/0064764	A1	3/2005	Shinohara	
2006/0098828	A1 *	5/2006	Chu et al.	381/110
2008/0137896	A1 *	6/2008	Tsen	381/370
2008/0285776	A1 *	11/2008	Wu et al.	381/114
2009/0277762	A1 *	11/2009	Nakatsuka et al.	200/11 R
2010/0111321	A1 *	5/2010	Ku	381/81
2010/0215183	A1 *	8/2010	Hansson et al.	381/58
2013/0044892	A1 *	2/2013	Lafky et al.	381/74

FOREIGN PATENT DOCUMENTS

CN	101232742	B *	10/2011
TW	200952276	A	12/2009
TW	I324891		5/2010
TW	201143226		12/2011
WO	WO 2006119625	A1 *	11/2006

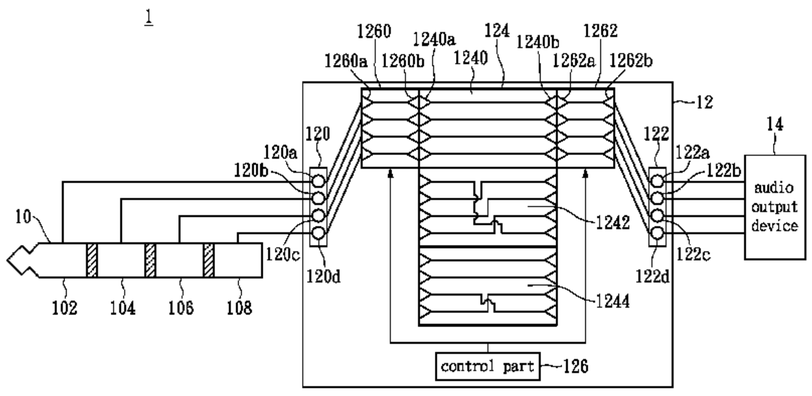
* cited by examiner

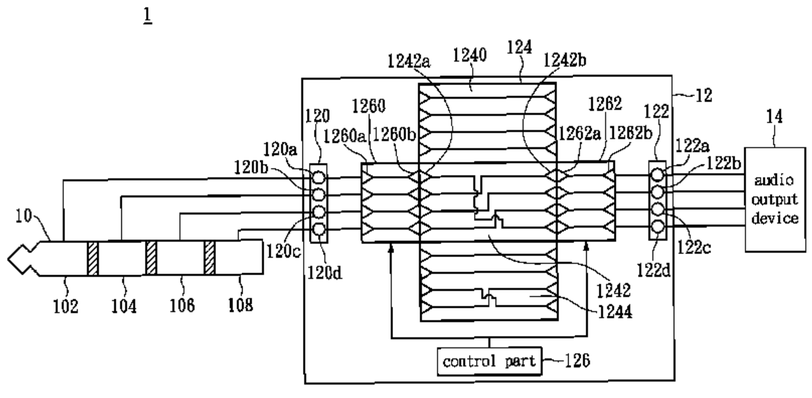
Primary Examiner — Davetta W Goins
Assistant Examiner — Kuassi Ganmavo
(74) *Attorney, Agent, or Firm* — Li & Cai Intellectual Property (USA) Office

(57) **ABSTRACT**

An audio transmission line having an audio transmission plug and an inline controller and a headset is disclosed In the inline controller, one signal input end of signal input module is coupled to one signal transmission unit of the audio transmission plug. The first control part mechanically links up the first and second conductive part, for controlling the input end of first conductive part for connecting with several signal input ends of signal input module, and controlling the output end of the first conductive part for connecting with the input end of one wire circuit, or, controlling the input end of the second conductive part for connecting with the output end of the same wire circuit, and controlling the output end of the second conductive part for connecting with signal output ends of signal output module.

12 Claims, 12 Drawing Sheets





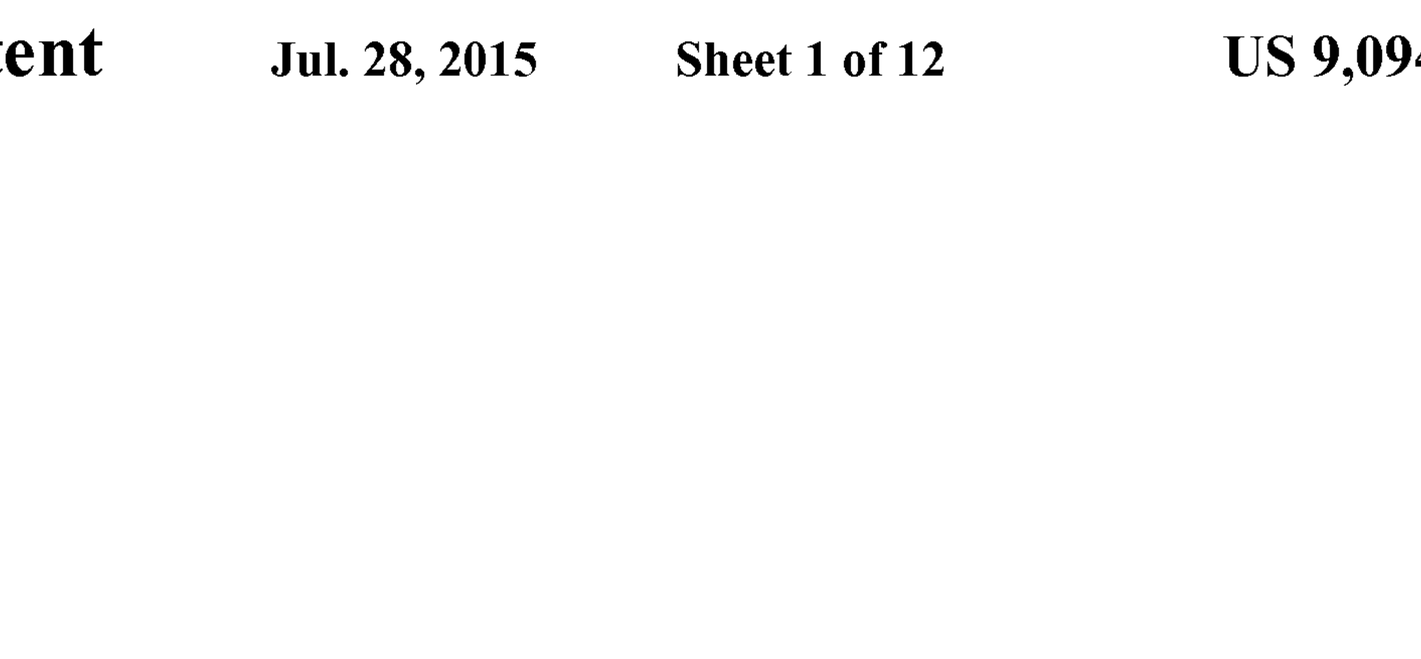


FIG. 1
PRIOR ART

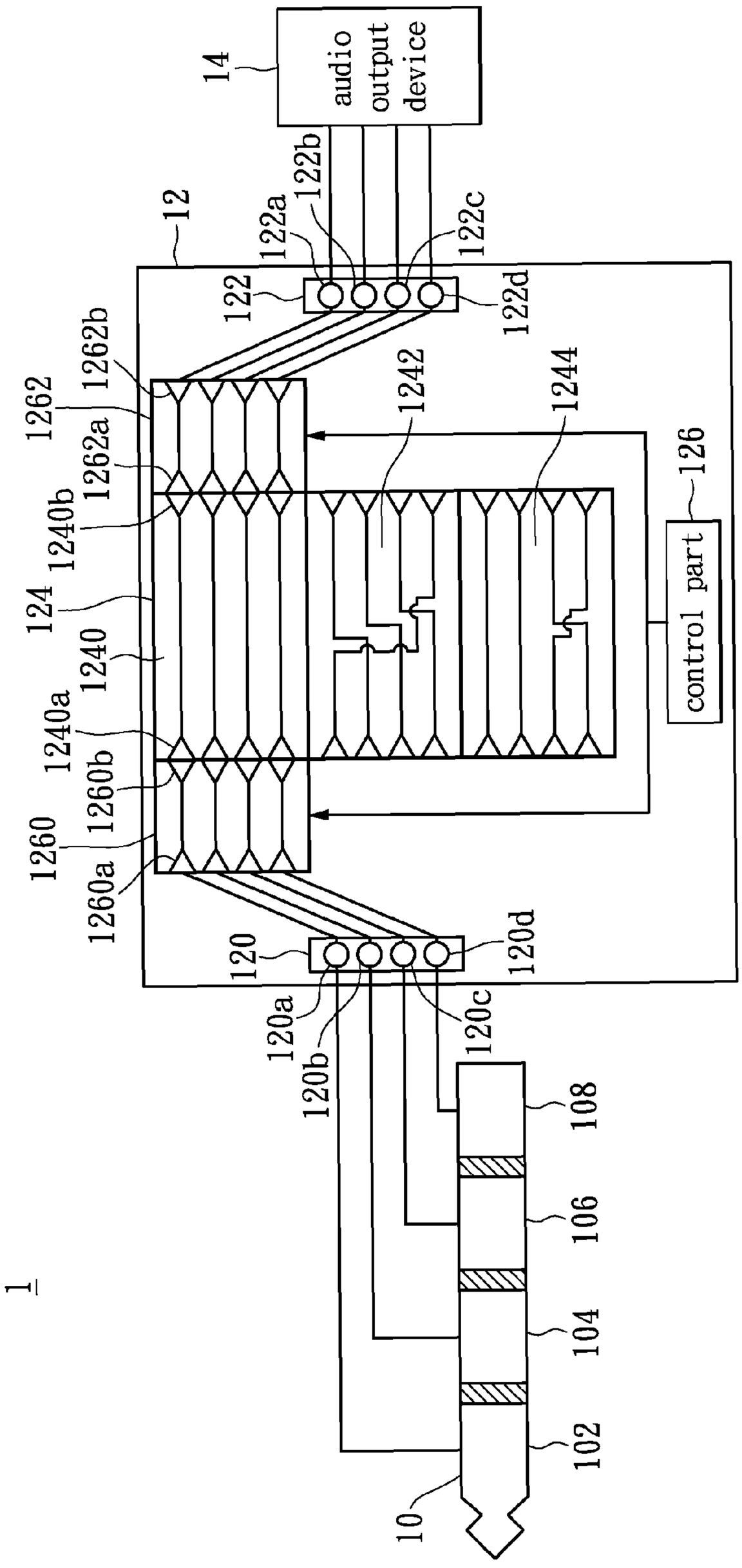

1
14
audio output device
12
122a
122b
122c
122d
122
1262b
1262
1262a
1240b
124
1240
1240a
1260b
1260
1260a
1242
1244
126
control part
120
120a
120b
120c
120d
108
106
104
102
10

FIG. 2A

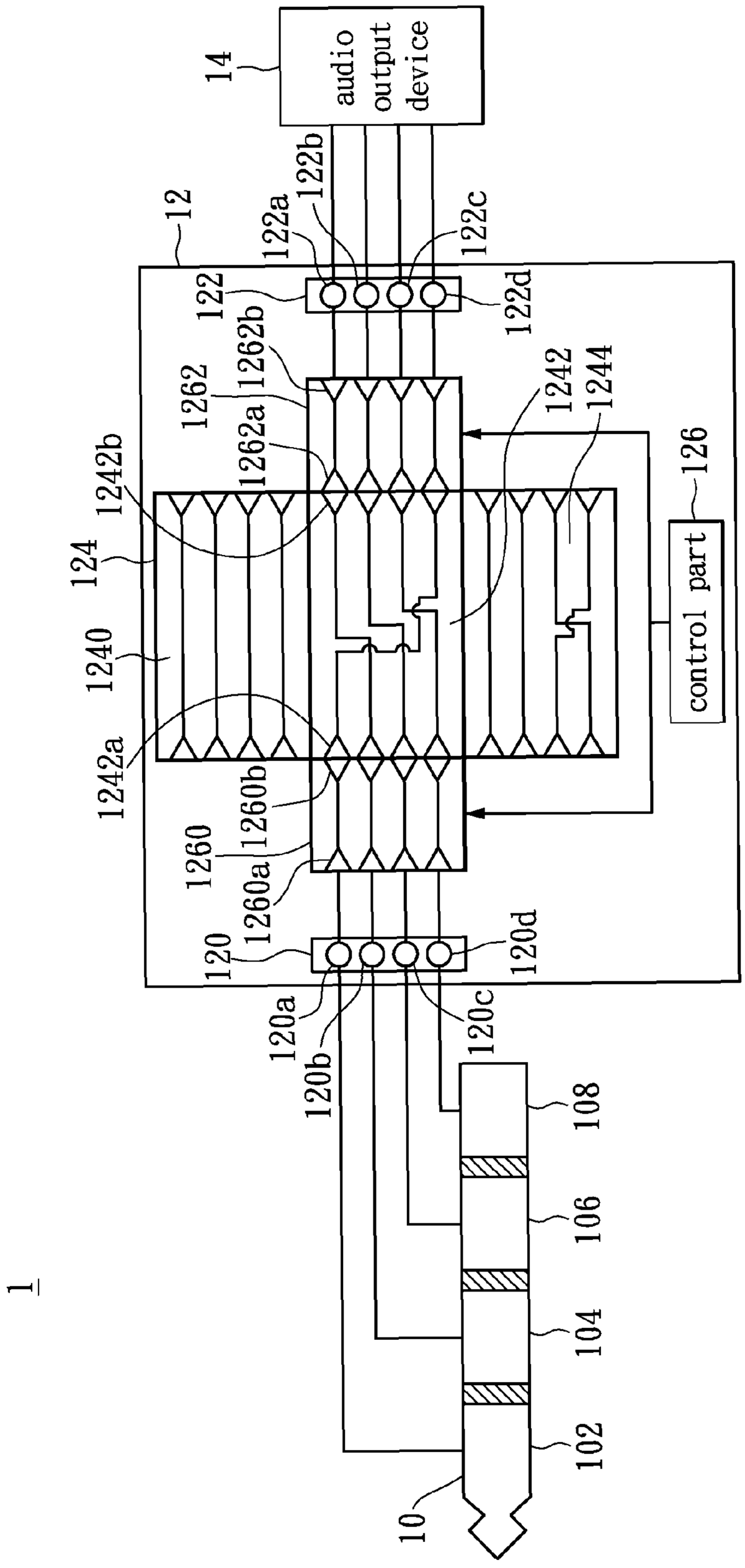

1
10
102
104
106
108
120
120a
120b
120c
120d
122
122a
122b
122c
122d
124
126
1240
1242
1242a
1242b
1244
1260
1260a
1260b
1262
1262a
1262b
12
14
audio output device
control part

FIG. 2B

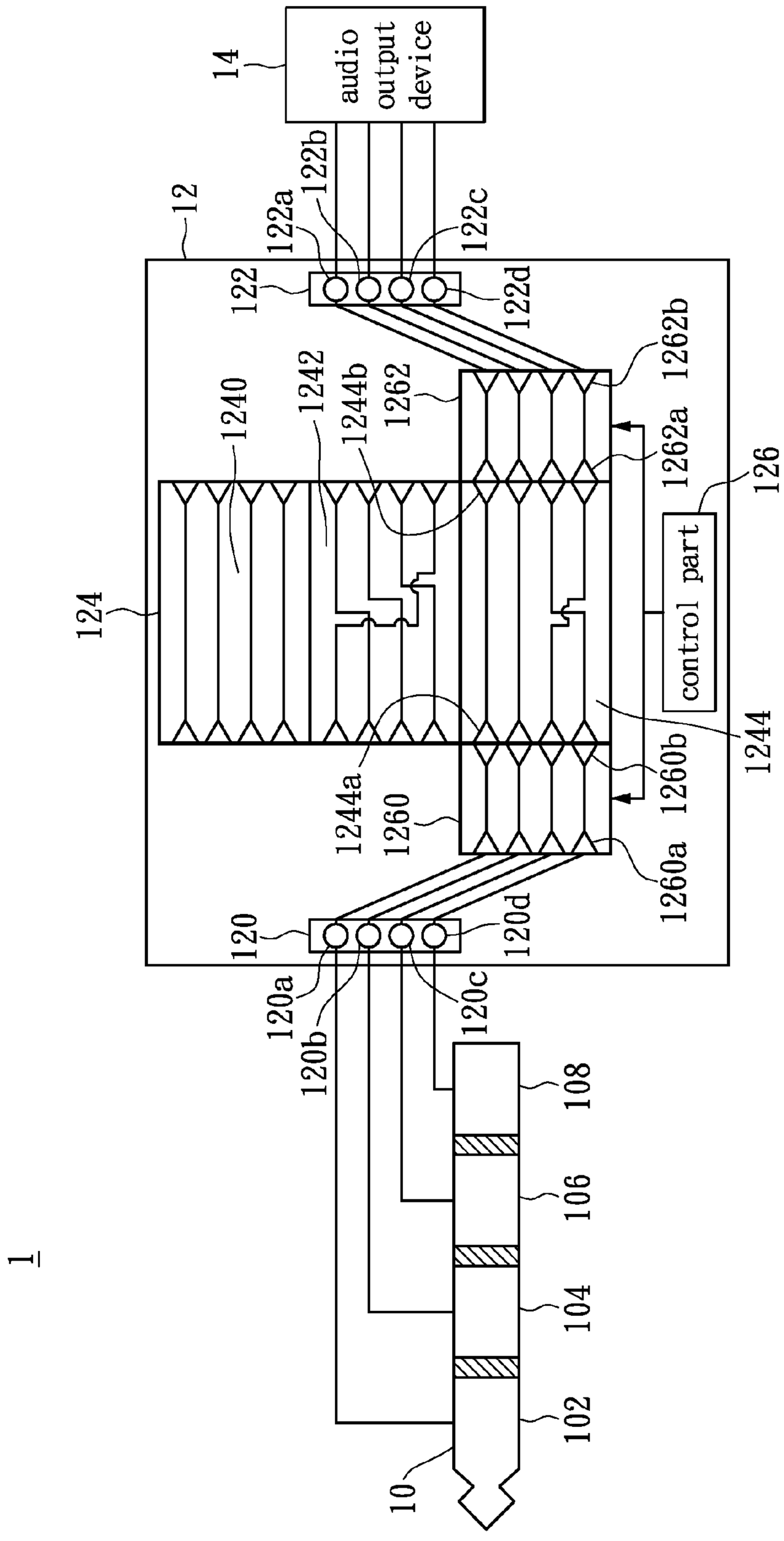

1
10
102
104
106
108
120
120a
120b
120c
120d
122
122a
122b
122c
122d
audio output device
12
124
126
control part
1240
1242
1244
1244a
1244b
1260
1260a
1260b
1262
1262a
1262b
14

FIG. 2C

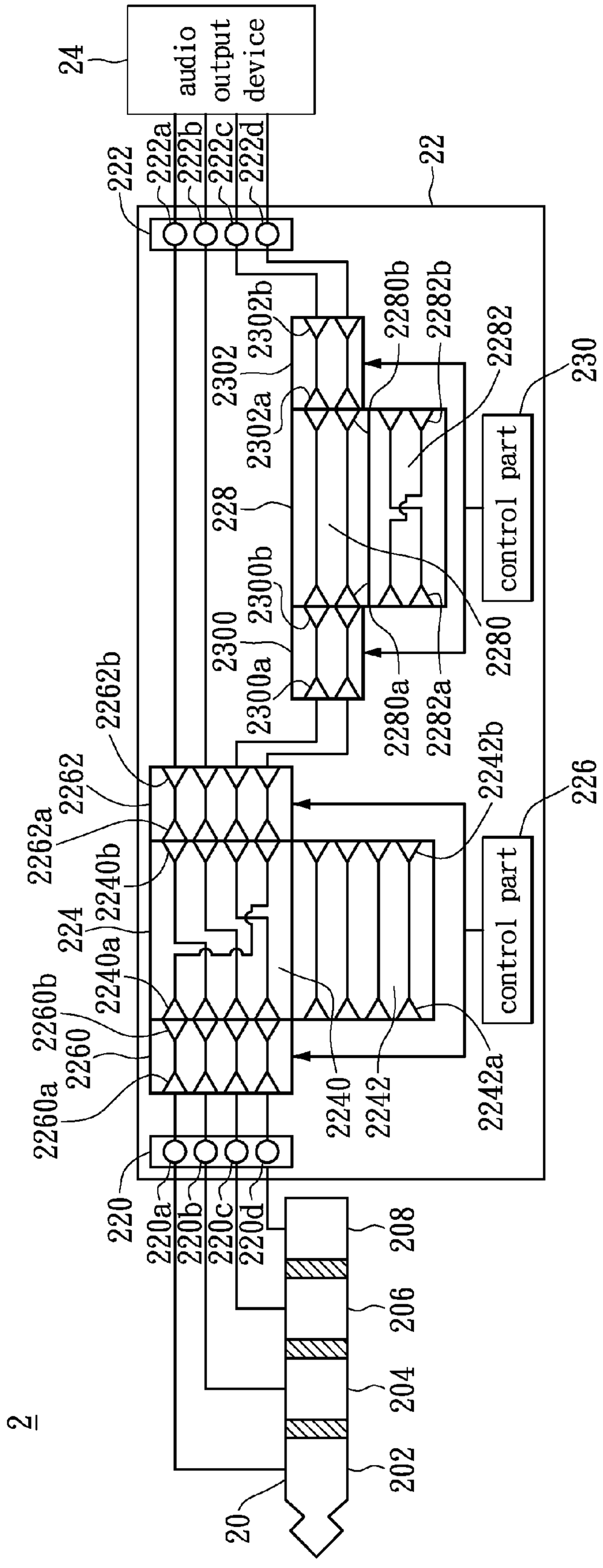

24
audio output device
222
222a
222b
222c
222d
22
2302b
2280b
2282b
2282
230
2302
2302a
228
2300b
2300
2300a
2280
2280a
2282a
control part
2262b
2262
2262a
2242b
226
224
2240b
2240a
2260b
2260
2260a
2240
2242
2242a
control part
220
220a
220b
220c
220d
208
206
204
202
20
2

FIG. 3A

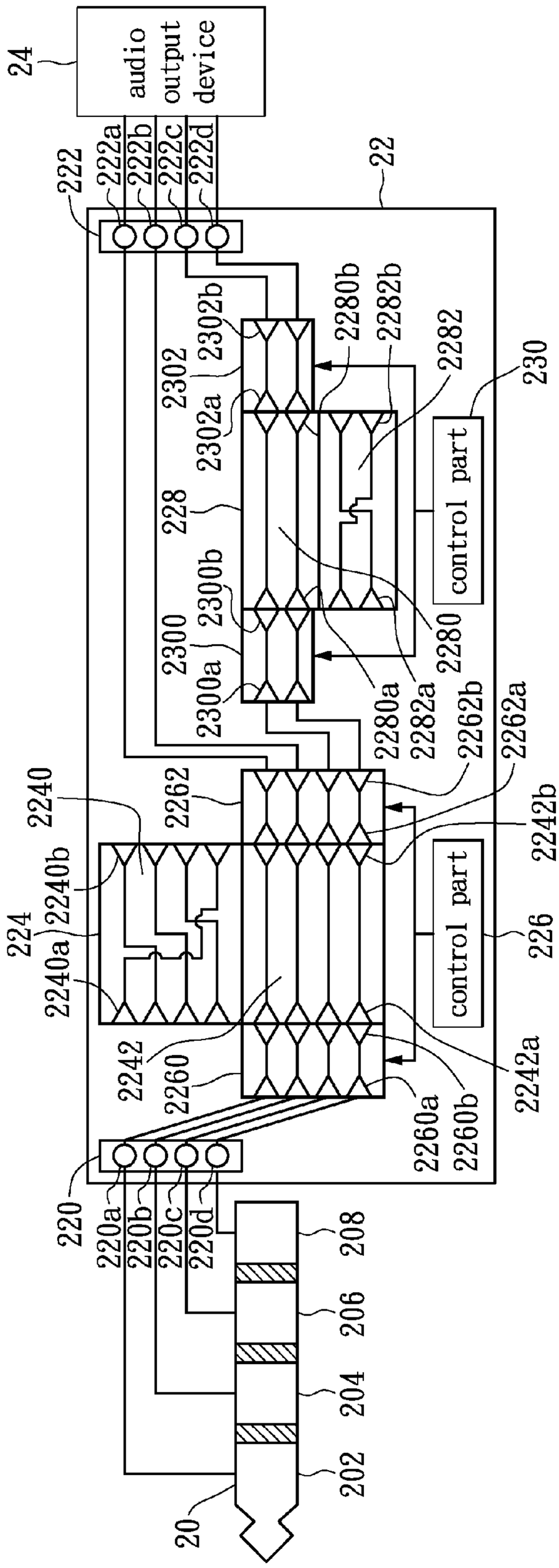

24
audio output device
222
222a
222b
222c
222d
22
2302b
2280b
2282b
2302
2302a
228
2300
2300b
2300a
2280
2280a
2282a
2262b
2262a
2262
2240
2240b
2242b
224
2240a
2242
2260
2242a
control part
226
220
220a
220b
220c
220d
208
206
204
202
20
2

FIG. 3B

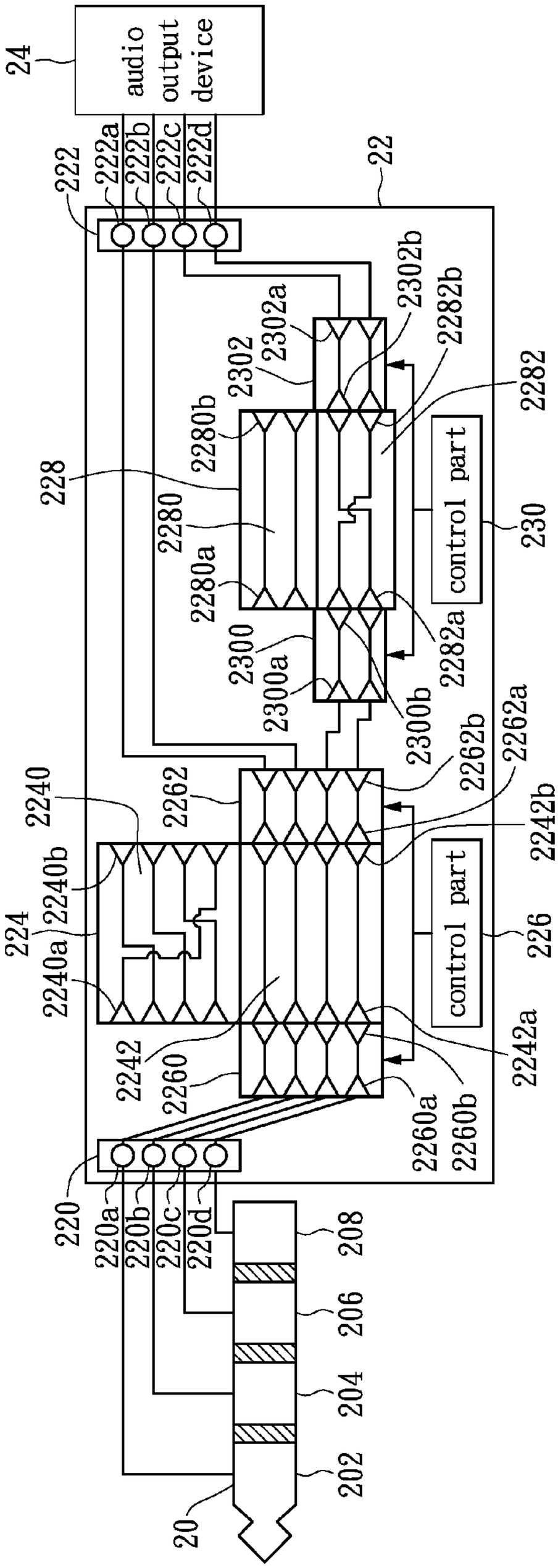

24
audio output device
222
222a
222b
222c
222d
22
2302b
2302a
2282b
2302
2282
2280b
228
2280
2280a
control part
230
2300
2300a
2282a
2300b
2262a
2262b
2262
2240
2242b
2240b
224
2240a
2242
2260
2242a
control part
226
2260a
2260b
220
220a
220b
220c
220d
208
206
204
202
20
21

FIG. 3C

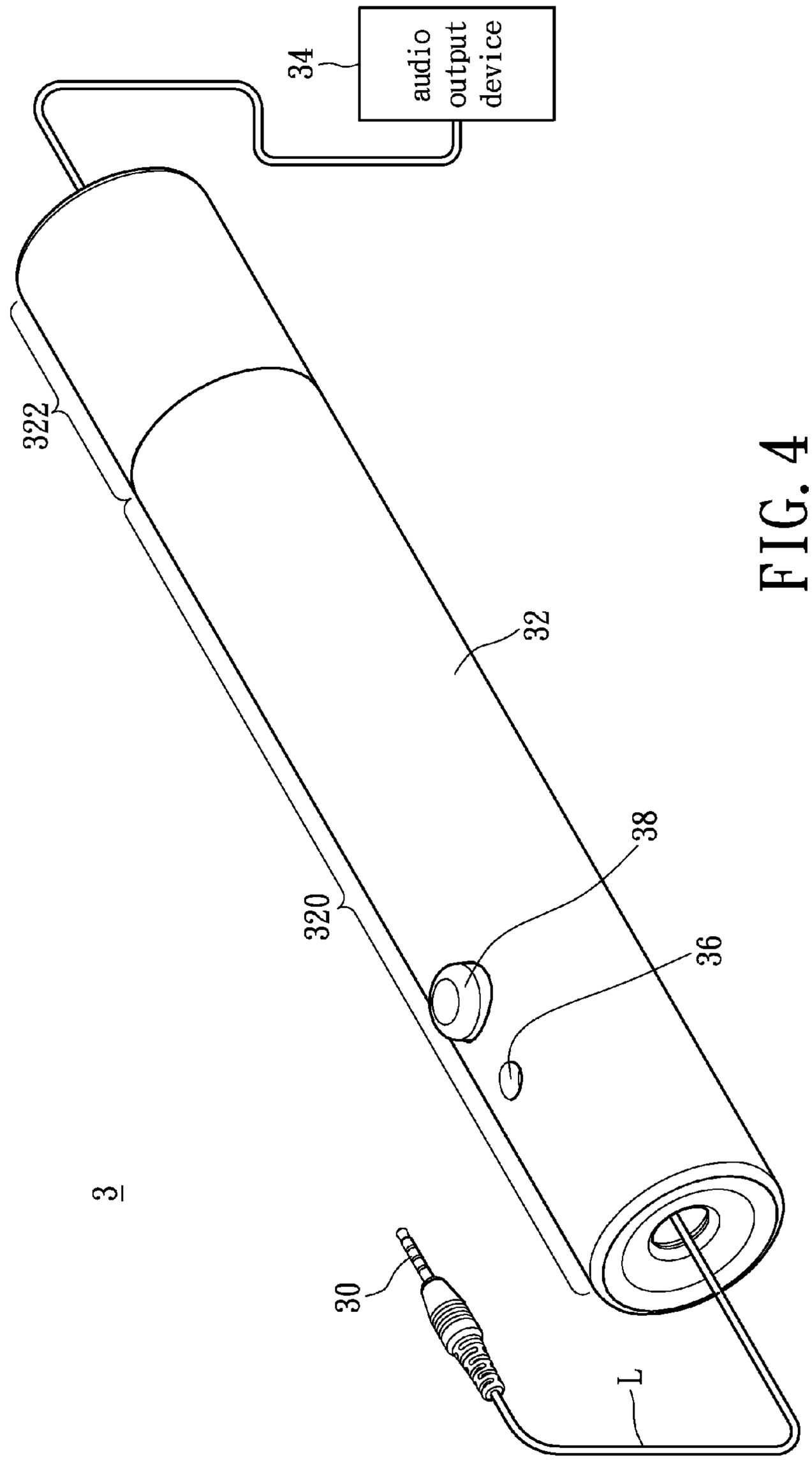


FIG. 4

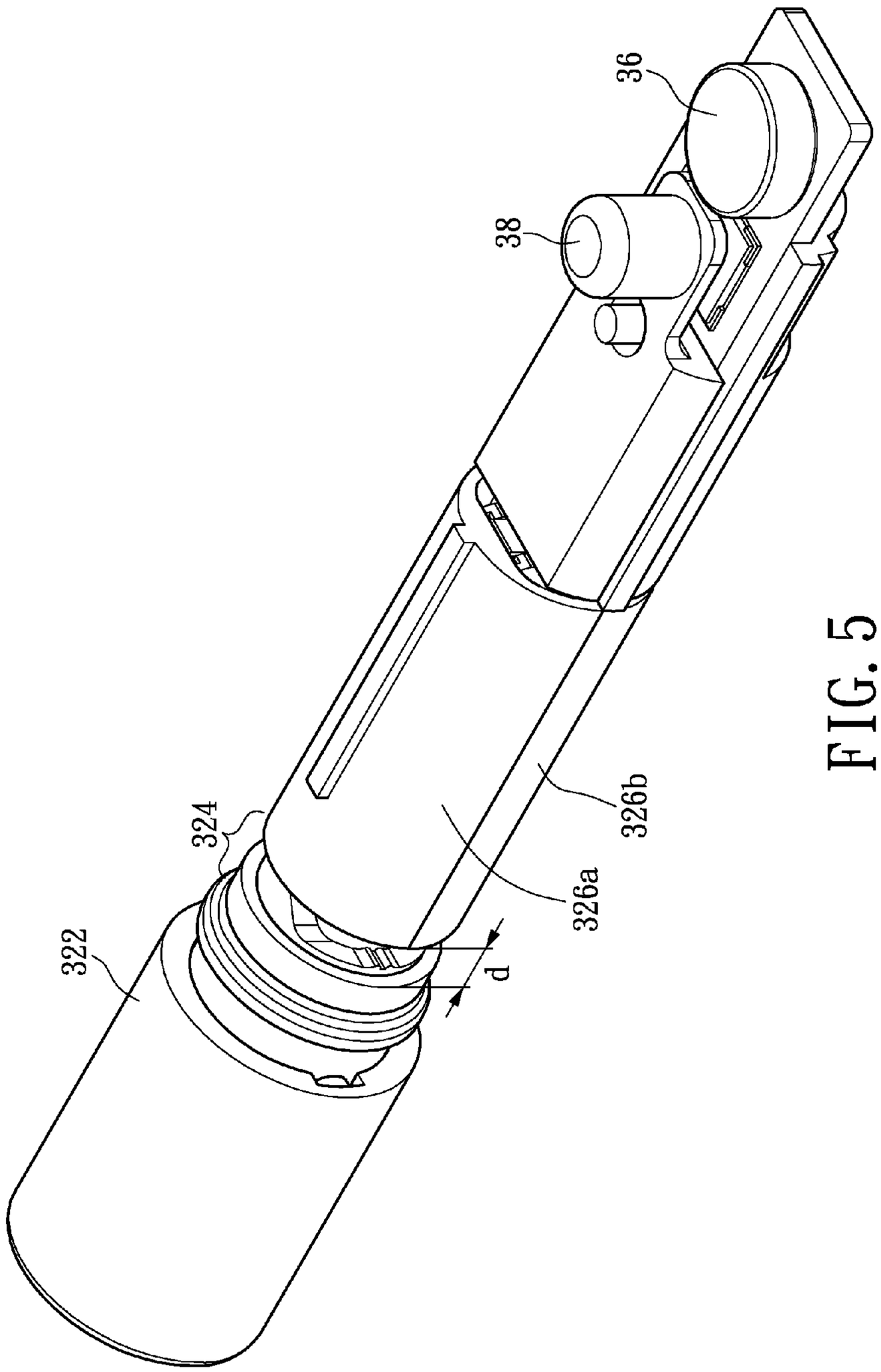


FIG. 5

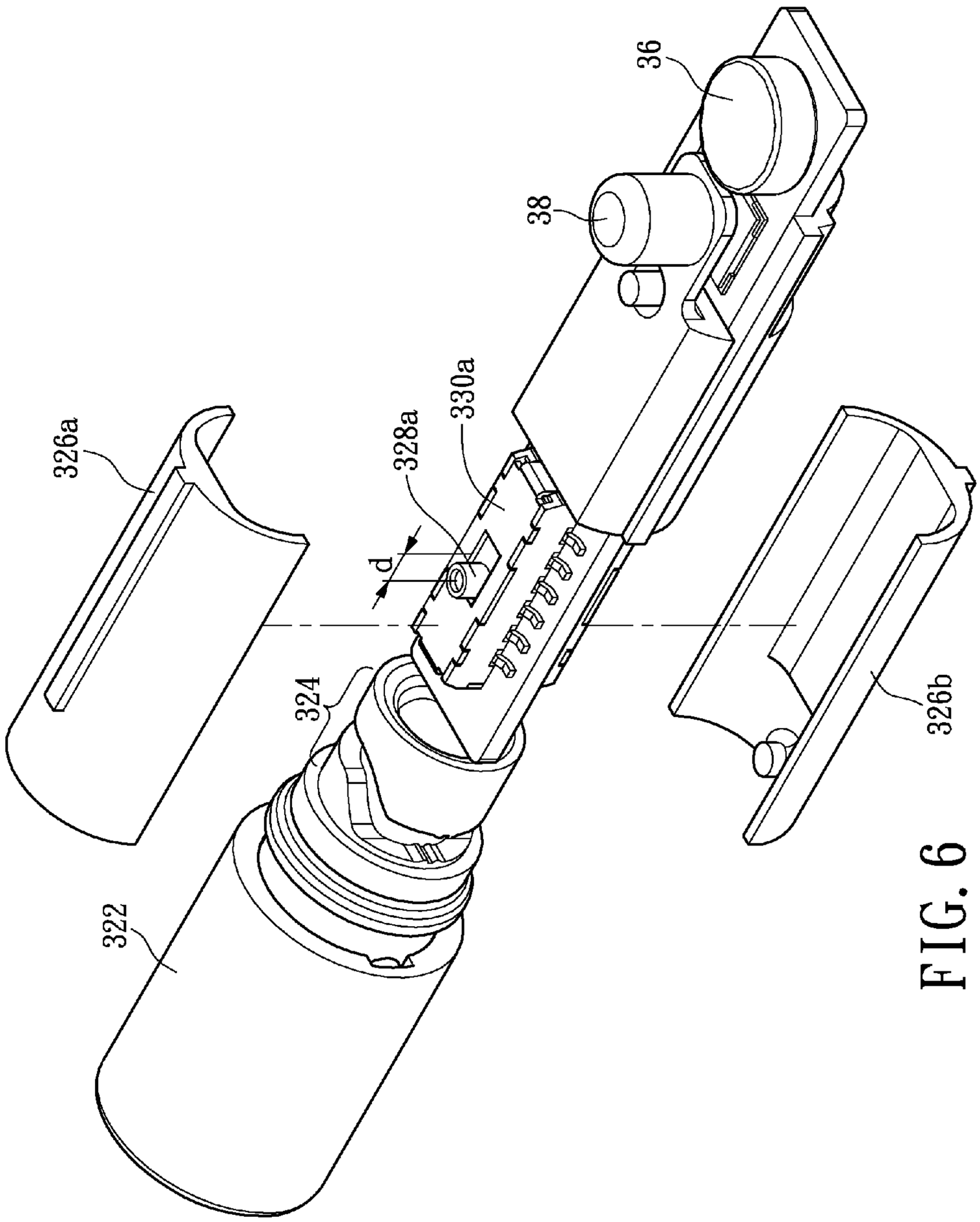


FIG. 6

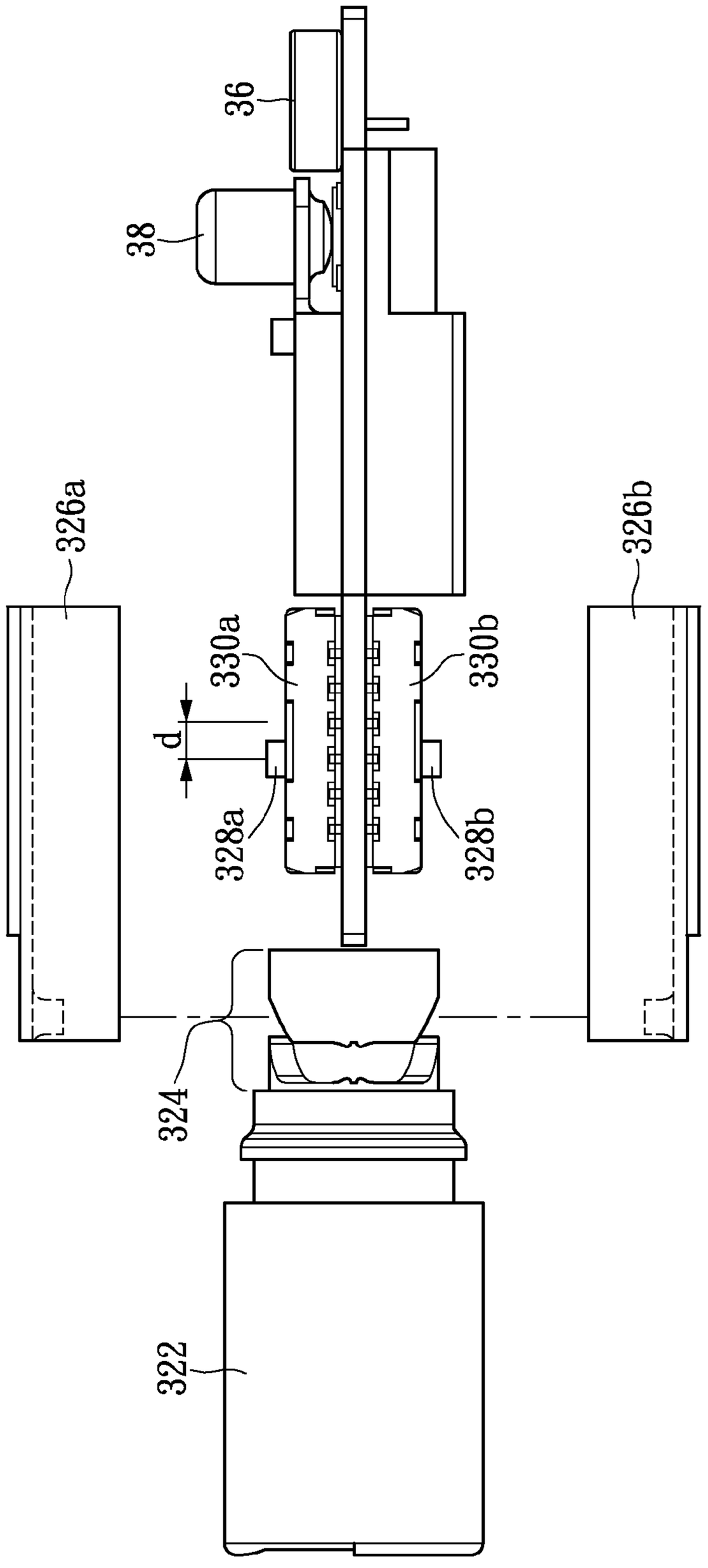


FIG. 7

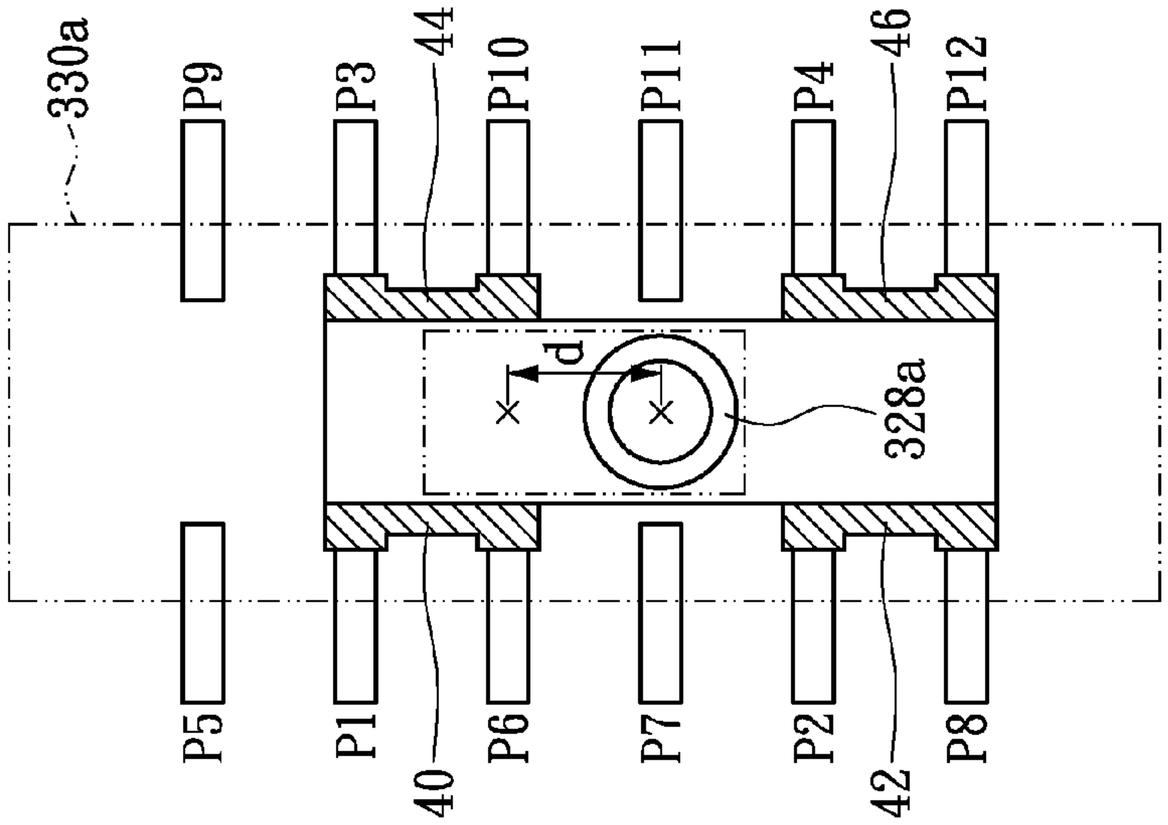

330a
P9
P3
44
P10
P11
P4
46
P12
d
328a
P5
P1
40
P6
P7
P2
42
P8

FIG. 8B

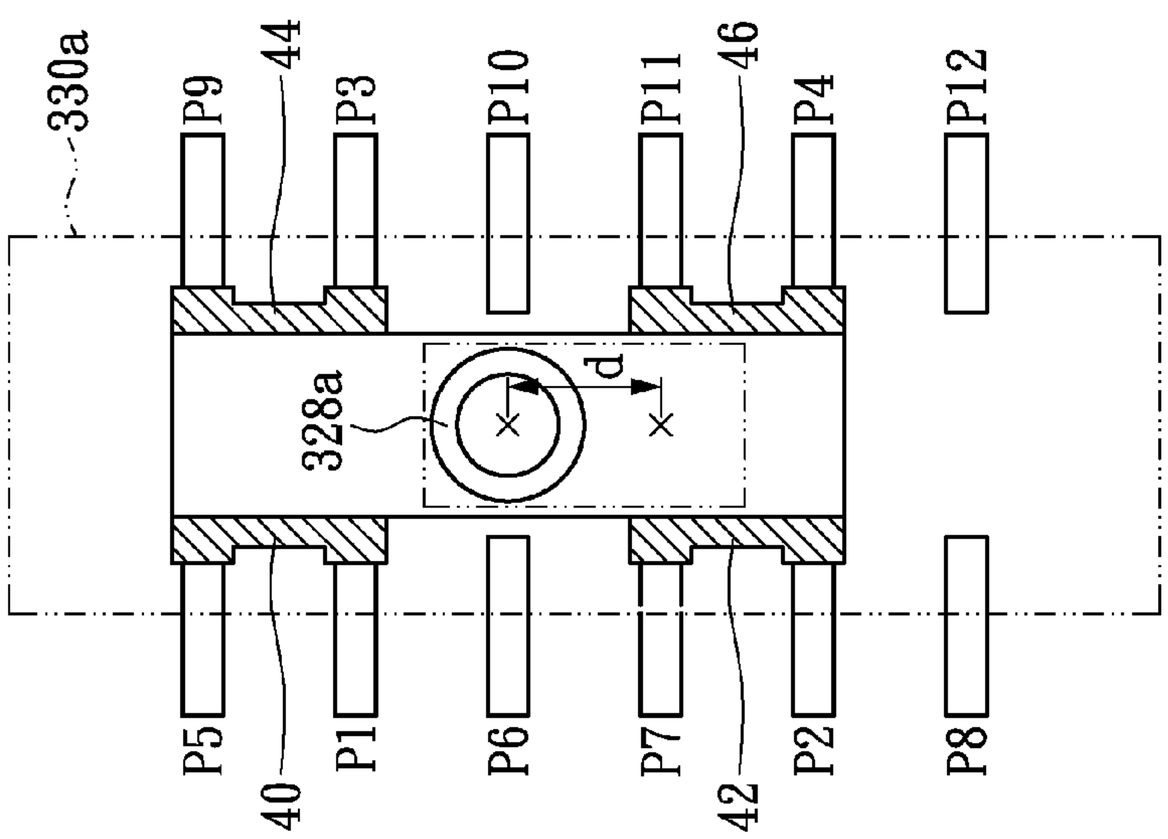

330a
P9
44
P3
P10
P11
46
P4
P12
328a
d
P5
40
P1
P6
P7
42
P2
P8

FIG. 8A

AUDIO TRANSMISSION LINE AND HEADSET

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an audio transmission line and a headset; in particular, to an audio transmission line and a headset with capabilities of switching the transmission order of the input signals.

2. Description of Related Art

Generally, when the user wants to hear the audio sounds of an electrical device (such as a mobile phone, an MP3 player, or a PDA, etc.), besides using the speaker of the electrical device, he or she may connect the audio transmission plug of a headset to the headset socket of the electrical device, which allows the speaker of the headset to play the audio signals transmitted from the electrical device. Along with the improvement of the technology, the audio transmission plugs of the headset may be classified into two types: three-section type and four-section type, and each section may be a signal transmission unit. Presently, the headset socket of the electrical device usually has four signal coupling ends, for being corresponded to the four-section type audio transmission plug, which allows each signal transmission unit to carry different headset signals. In this case, the headset signals carried by the signal transmission units may be a left sound track signal, a right sound track signal, a microphone signal, and a ground signal.

Take the mobile phone as an example, although the size of the headset socket has its standard specification, the definitions of four signal coupling ends may be different among various of manufacturers. For example, part of the mobile phone manufacturers may be used to transmitting left sound track signals by using the first signal coupling end of the headset socket (which corresponds to the first signal transmission unit of the audio transmission plug of the headset), while other manufacturers uses the same headset socket for transmitting the microphone signals.

That is, the transmission order of headset signals may be various among different manufacturers. However, because the inner circuits of the conventional headset are fixed, if the first signal transmission unit is predetermined to connect with the left side speaker, apparently, the left side speaker can only correctly interpret left sound track signals, rather than microphone signals. On the other hand, if the first signal transmission unit is predetermined to connect with the microphone component which can only correctly interpret the microphone signals rather than left sound track signals.

In order to solve the problem of the difference of the transmission order, the R.O.C. invention patent I324891 discloses a headset which may read several kinds of headset signals, which its main content is shown in FIG. **1**. As shown in FIG. **1**, the headset device **9** in the patent I324891 has an audio transmission plug **90** and several sets of switches SW**1** to SW**4**. The signal transmission unit **902** is correspondingly connected with switch SW**1**, similarly, the signal transmission units **904** to **908** are respectively connected with the switch SW**2** to SW**4** one-to-one. In addition, the audio transmission plug **90** may receive the left sound track signals, the right sound track signals, the microphone signals, and the ground signals from the mobile phone through the signal transmission units **902** to **908**.

In this case, the patent I324891 claimed that due to the uncertainty of the order of left sound track signals, right sound track signals, microphone signals, and ground signals (which depend on the specifications of manufacturers), there may be sixteen types of modes of signal transmission of the

headset device **9**. Take switch SW**1** for example, it may freely output the headset signals carried by the signal transmission unit **902** as left sound track signals LCH, right sound track signals RCH, microphone signals MIC, or ground signals GND, depending on which signals are accepted by the headset. That is, patent I324891 solves the problem of headset signal transmission order by allowing the four switched to output all of the left sound track signals LCH, the right sound track signals RCH, the microphone signals MIC, and the ground signals GND.

However, seeing from the aspects of practical using and manufacturing, implementing the sixteen switch types shown in patent I324891 (especially in FIG. **3**), which makes the four switches output the four acceptable signals (LCH, RCH, MIC, and GND) respectively by only the mechanical and structural operations, is apparently impossible. We can know from line 11 of page 9 of the patent I324891 that it needs to install an extra control signal generator for generating control signals, and uses the control signals to shift the transmission modes the four switches. In other words, the patent I324891 actually uses an IC chip to control the four switches for selecting the sixteen transmission modes.

A person skilled in the art may know that it is hard for a user to select the correct signal transmission mode from the sixteen modes (especially when the user does not know what the differences between the several signal transmission orders are). In addition, if the headset need to include the IC chip, its manufacturing cost increases, and there may also need extra battery or power line for providing electric power to the IC chip, which makes the headset lack of competitiveness.

It's worth noting that, the R.O.C. disclosure No. 201143226 discloses a headset which claims to be able to implement the switch signal circuit by mechanical and structural operations. However, as shown in lines 11 to 14 of page 9 of the disclosure, it only discloses the techniques of switching the audio transmission plug between three-section type and four-section type, and does not solve the problem of signal transmission order. Moreover, because the structure shown in the disclosure is too simple, one skilled in the art cannot implement more complex switching by referring to both the patent I324891 and the disclosure 201143226.

Therefore, solving the aforementioned problem of the transmission order of the headset signals is still a goal to be achieved.

SUMMARY OF THE INVENTION

The object of the present invention is to provide an audio transmission line which is able to mechanically switch the connection relation between physical circuits, in order to make the headset signals of the audio transmission plug be received by the headset correctly. Therefore, without IC chip, the present invention may still solve the problem of the uncertainty of the transmission order of the headset signals defined by different manufacturers.

An embodiment of the present invention provides an audio transmission line which has an audio transmission plug and an inline controller. The audio transmission plug includes a plurality of signal transmission units for transmitting several headset signals of an electrical device. The inline controller is coupled to the audio transmission plug through a signal cable, and has a signal input module, a signal output module, a first control part, and several sets of wire circuits. The signal input module includes a plurality of signal input ends, and each of them is coupled to one of the signal transmission units one-to-one. The signal output module has several signal output ends. The first control part mechanically links up at least a

first conductive part and a second conductive part. The input end of the first conductive part is coupled to the signal input ends, and the output end of the second conductive part is coupled to the signal output ends. There is a predetermined pin connection relationships between the input end and the output end of each set of the wire circuits, and the predetermined pin connection relationships of each of the wire circuits are different from one another. In addition, the first control part may selectively control the output end of the first conductive part for coupling to the input end of one of the wire circuits, or may control the input end of the second conductive part for coupling to the output end of the same wire circuit.

In an embodiment of the present invention, the inline controller has a first body and a second body. The first body is used for accommodating a first switch, and the second body may be rotatably connected with the first body. When the second body is rotated relative to the first body, the second body links up the first control part, for allowing the first control part to control the first conductive part and the second conductive part for being coupled to the same wire circuit.

In addition, an embodiment of the present invention also provides a headset which may be able to switch the electrical connection of the physical circuits, in order to make the headset signals of the audio transmission plug be received by the headset correctly. Therefore, without the IC chip, the present invention may still solve the problem of the uncertainty of the transmission order of the headset signals defined by different manufacturers.

An embodiment of the present invention discloses a headset having an audio transmission plug, an inline controller, and an audio output device. The audio transmission plug has several signal transmission units, for transmitting a plurality of headset signals of an electrical device. The inline controller is coupled to the audio transmission plug through a signal cable, and has a signal input module, a signal output module, a first control part, and a first switch. The signal input module has a plurality of signal input ends, and each of them is coupled to one of the signal transmission units one-to-one. The signal output module has several signal output ends. The first control part mechanically links up a first conductive part and a second conductive part. The input end of the first conductive part is coupled to the signal input ends, and the output end of the second conductive part is coupled to the signal output ends. The first switch has several sets of wire circuits, and there is a predetermined pin connection relationships between the input end and the output end of each wire circuit. The predetermined pin connection relationships of each of the wire circuits are different from one another. In addition, the first control part may selectively control the output end of the first conductive part for coupling to the input end of one of the wire circuits, and may control the input end of the second conductive part for coupling to the output end of the same wire circuit. The audio output device is coupled to the signal output module, for generating sounds according to the order of the headset signals outputted by the signal output ends.

On the basis of the above, the audio transmission line and headset in the present invention have multiple sets of wire circuits with different predetermined pin connection relationships. The user may mechanically switch the different wire circuits by operating the control part according to different specifications of the electrical devices, in order to allow the headset signals transmitted by the audio transmission plug to be received by the headset correctly. Therefore, without the IC chip, the present invention may still solve the problem of the uncertainty of the transmission order of the headset signals defined by different manufacturers.

For further understanding of the present disclosure, reference is made to the following detailed description illustrating the embodiments and examples of the present disclosure. The description is only for illustrating the present disclosure, not for limiting the scope of the claim.

BRIEF DESCRIPTION OF THE DRAWINGS

The drawings included herein provide further understanding of the present disclosure. A brief introduction of the drawings is as follows:

FIG. **1** shows a function block diagram of the conventional headset;

FIG. **2**A shows a schematic circuit diagram of a headset coupled to a set of wire circuit according to an embodiment of the present invention;

FIG. **2**B shows a schematic circuit diagram of a headset coupled to another set of wire circuit according to an embodiment of the present invention;

FIG. **2**C shows a schematic circuit diagram of a headset coupled to still another set of wire circuit according to an embodiment of the present invention;

FIG. **3**A shows a schematic circuit diagram of a headset coupled to a set of wire circuit and a set of auxiliary wire circuit according to an embodiment of the present invention;

FIG. **3**B shows a schematic circuit diagram of a headset coupled to another set of wire circuit and a set of auxiliary wire circuit according to an embodiment of the present invention;

FIG. **3**C shows a schematic circuit diagram of a headset coupled to another set of wire circuit and another set of auxiliary wire circuit according to an embodiment of the present invention;

FIG. **4** shows a three dimensional view of the headset in FIG. **3**A;

FIG. **5** shows an diagram of part of the inner structure of the headset in FIG. **4**;

FIG. **6** shows an diagram of part of the inner structure of the headset in FIG. **5**;

FIG. **7** shows an diagram of part of the inner structure of the headset in FIG. **6**;

FIG. **8**A shows a schematic structural diagram of a third linkage part and a switch according to an embodiment of the present invention; and

FIG. **8**B shows another schematic structural diagram of a third linkage part and a switch according to an embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The aforementioned illustrations and following detailed descriptions are exemplary for the purpose of further explaining the scope of the present invention. Other objectives and advantages related to the present invention will be illustrated in the subsequent descriptions and appended drawings.

[An Exemplary Embodiment of a Headset According to the Present Invention]

Please refer to FIG. **2**A. FIG. **2**A shows a schematic circuit diagram of a headset coupled to one set of wire circuit according to an embodiment of the present invention. As shown in FIG. **2**A, a headset **1** of the present invention has an audio transmission plug **10**, an inline controller **12**, and an audio output device **14**. Practically, the audio transmission plug **10** is connected with the inline controller **12** through a signal cable (not shown in FIG. **2**A), and the audio output device **14** may be a common speaker or microphone. In this case, the

audio transmission plug **10** and the inline controller **12** may be seen as an audio transmission line, and the audio output device **14** may be fixed or pluggably connected to a signal output module of the audio transmission line. The following descriptions show the relations and functionalities of each component of the headset **1**.

The audio transmission plug **10** has signal transmission units **102**, **104**, **106**, and **108**, for transmitting one type of headset signals respectively. Practically, the audio transmission plug **10** is plugged in an electrical device (not shown), and the headset signals include left sound track signals, right sound track signals, microphone signals, and ground signals. Because the electrical device does not fix the output order of the left sound track signals, the right sound track signals, the microphone signals, and the ground signals, the present invention does not restrict the type of headset signals carried by each of the signal transmission units (**102** to **108**). In addition, the present invention also does not restrict the size of the audio transmission plug **10**. For example, the audio transmission plug **10** may be plugged in the 2.5 mm or 3.5 mm headset hole, which may be designed by one skilled in the art according to the actual requirements.

In this embodiment, the inline controller **12** has a signal input module **120**, a signal output module **122**, a switch **124**, and a control part **126**. the signal input module **120** has a plurality of signal input ends (**120***a* to **120***d*), and each of the signal input ends is coupled to one of the signal transmission units (**102** to **108**) in one-to-one fashion. For explanation, this embodiment shows that the signal input end **120***a* is coupled to the signal transmission unit **102**, the signal input end **120***b* is coupled to the signal transmission unit **104**, the signal input end **120***c* is coupled to the signal transmission unit **106**, and the signal input end **120***d* is coupled to the signal transmission unit **108**. However, the connection described is not used for limiting the scope of the present invention. For example, the signal input end **120***a* may also be coupled to any other signal transmission units. Under the situation of one-to-one connection between the signal input end and the signal transmission unit, the one skilled in the art may change the connection between the signal input end and the signal transmission unit.

The signal output module **122** has several signal output ends (**122***a* to **122***d*), for allowing the headset signals to be transmitted between the audio output device **14** and the inline controller **12**. Practically, the audio output device **14** may have the corresponding left speaker transmission end, right speaker transmission end, ground end, and microphone transmission end. For example, the signal output end **122***a* may be pre-connected to the left speaker transmission end, the signal output end **122***b* may be pre-connected to the right speaker transmission end, the signal output end **122***c* may be pre-connected to the ground end, and the signal output end **122***d* may be pre-connected to the microphone transmission end. In other words, if the signal output end **122***a* receives the left sound track signals, the signal output end **122***b* receives the right sound track signals, the signal output end **122***c* receives the ground signals, and the signal output end **122***d* receives the microphone signals correctly, the audio output device **14** may work normally.

The switch **124** has several sets of wire circuits (**1240** to **1244**). There is a predetermined pin connection relationships between the input end and the output end of each set of wire circuits, and the predetermined pin connection relationships of different wire circuits are different from one another. In addition, the control part **126** mechanically links up the conductive parts **1260** and **1262**. Thus, the control part **126** may selectively control the conductive parts **1260** and **1262** to respectively connect with two ends of one of the wire circuits (**1240** to **1244**). For example, FIG. **2**A shows an embodiment that the user directly operates the control part **126** for respectively coupling the conductive parts **1260** and **1262** to the two ends of the wire circuit **1240**.

Practically, the conductive part **1260** may have a set of input ends **1260***a* and a set of output ends **1260***b*. The input ends **1260***a* and the output ends **1260***b* may each have four independent conductive points, and the first to fourth conductive points of the input ends **1260***a* are respectively and electrically connected with the first to fourth conductive points of the output ends **1260***b*. In addition, the four conductive points of the input ends **1260***a* of the conductive part **1260** are respectively coupled to the signal input ends (**120***a* to **120***d*), and the four conductive points of the output ends **1262***b* of the conductive part **1262** are respectively coupled to the signal output ends (**122***a* to **122***d*). It is worth noting that the coupling relations between the conductive part **1260** and the signal input module **120**, and between the conductive part **1262** and the signal output module **122** are fixed, and do not change when the control part **126** mechanically links up the conductive parts **1260** and **1262**.

Back to FIG. **2**A, when the conductive parts **1260** and **1262** are respectively coupled to the two ends of the wire circuit **1240**, the output end **1260***b* of the conductive part **1260** connected with the input end **1240***a* of the wire circuit **1240**. The input end **1240***a* of the wire circuit **1240** may also have four conductive points for respectively corresponding to the four conductive points of the output end **1260***b* of the conductive part **1260**. Similarly, the output end **1240***b* of the wire circuit **1240** may also have four conductive points for respectively corresponding to the four conductive points of the input ends **1262***a* of the conductive part **1262**. Thus, when the user knows the signal transmission unit **102** may receive the left sound track signals, he or she may choose to conduct the wire circuit **1240** by operating the control part **126**, in order to allow the signal output ends **122***a* to receive the left sound track signals correctly, and make the audio output device **14** work normally.

Because the signal transmission pins of the signal output module **122** and the audio output device **14** is fixed (for example, the signal output ends **122***a* to **122***d* are respectively coupled to the left speaker transmission end, the right speaker transmission end, the ground end, and the microphone transmission end), the control part **126** is used for selecting a proper wire circuit **1240**. The selected wire circuit **1240** arranges the headset signals received by the audio transmission plug **10**, and switches the headset signals to the correct signal transmission path, which allows each signal output end (**122***a* to **122***d*) of the signal output module **122** to receive the correct headset signals for sending to the audio output device **14**. That is, when the control part **126** choose to conduct the wire circuit **1240**, the signal input end **120***a* of the signal input module **120** may directly and electrically connect with the signal output end **122***a* of the signal output module **122** through the conductive part **1260**, the wire circuit **1240**, and the conductive part **1262**. Thus, the headset **1** in this embodiment may directly transmit the left sound track signals carried by the signal transmission unit **102** of the audio transmission plug **10** to the left speaker transmission end of the audio output device **14**. Of course, other kinds of headset signals may also be transmitted to the proper transmission ends of the audio output device **14** by using the similar manners.

Under a situation, if the electrical device is a mobile phone, and the manufacturer thereof is Apple, HTC, or Samsung, the first signal transmission unit **102** (the first section) of the audio transmission plug **10** is designed for transmitting the left sound track signals, the second signal transmission unit

104 (the second section) of the audio transmission plug **10** is designed for transmitting the right sound track signals, the third signal transmission unit **106** (the third section) of the audio transmission plug **10** is designed for transmitting the ground signals, and the fourth signal transmission unit **108** (the fourth section) of the audio transmission plug **10** is designed for transmitting the microphone signals. As shown in FIG. **2**A, because a signal transmission path is set between the first conductive point of the input end **1240***a* and the first conductive point of the output end **1240***b*, the left sound track signals of the first signal transmission unit **102** of the audio transmission plug **10** may be directly transmitted to the left speaker transmission end of the audio output device **14**. Similarly, because a signal transmission path is set between the second conductive point of the input end **1240***a* and the second conductive point of the output end **1240***b*, a signal transmission path is set between the third conductive point of the input end **1240***a* and the third conductive point of the output end **1240***b*, and a signal transmission path is also set between the fourth conductive point of the input end **1240***a* and the fourth conductive point of the output end **1240***b*, each kind of the headset signals may be transmitted to the audio output device **14** correctly.

However, under another situation, if the electrical device is the Blackberry mobile phone produced by RIM, the first signal transmission unit **102** (the first section) of the audio transmission plug **10** is designed for transmitting the microphone signals, the second signal transmission unit **104** (the second section) of the audio transmission plug **10** is designed for transmitting the left sound track signals, the third signal transmission unit **106** (the third section) of the audio transmission plug **10** is designed for transmitting the right sound track signals, and the fourth signal transmission unit **108** (the fourth section) of the audio transmission plug **10** is designed for transmitting the ground signals. Thus, the wire circuit **1240** shown in FIG. **2**A may not be able to transmit each of the headset signals to the audio output device **14** correctly.

Therefore, the user may directly operate the control part **126** for coupling the conductive parts **1260** and **1262** to the two ends of another wire circuit (such as the wire circuit **1242**), in order to make each of the signal output ends (**122***a* to **122***d*) of the signal output module **122** acquire the correct headset signals and transmit to the audio output device **14**.

It is worth noting that, although FIG. **2**A shows that the conductive parts **1260** and **1262** are both able to be moved relative to the switch **124**, the control part **126** may only control one of the conductive parts **1260** and **1262**. For example, when the control part **126** only controls the conductive part **1260**, the conductive part **1262** and the signal output module **122** may be combined together, which allows all of the output ends of the wire circuits (**1240** to **1244**) to be directly coupled to the signal output module **122**. On the other hand, when the control part **126** only controls the conductive part **1262**, the conductive part **1260** and the signal input module **120** may be combined, which allows all of the input ends of the wire circuits (**1240** to **1244**) to be directly coupled to the signal input module **120**. By doing so, the present embodiment may also make the wire circuits (**1240** to **1244**) of the switch **124** be correspondingly switched by moving the conductive part **1260** or **1262**.

Please refer to FIG. **2**B which shows a circuit diagram of a headset coupled to another set of wire circuit according to an embodiment of the present invention. The differences between FIGS. **2**A and **2**B are that in FIG. **2**B, the conductive parts **1260** and **1262** are coupled to the two ends of the wire circuit **1242**. Particularly, the wire circuit **1242** shown in FIG. **2**B has a signal transmission path between the first conductive point of the input end **1242***a* and the fourth conductive point of the output end **1242***b*, which makes the microphone signals of the first signal transmission unit **102** of the audio transmission plug **10** can be directly transmitted to the microphone transmission end of the audio output device **14**. In addition, a signal transmission path is set between the second conductive point of the input end **1242***a* and the first conductive point of the output end **1242***b;* a signal transmission path is set between the third conductive point of the input end **1242***a* and the second conductive point of the output end **1242***b;* and a signal transmission path is set between the fourth conductive point of the input end **1242***a* and the third conductive point of the output end **1242***b*. Thus, all kinds of headset signals may be able to be transmitted to the audio output device **14** correctly.

Under another situation, if the electrical device is a mobile phone manufactured by Nokia, the first signal transmission unit **102** (the first section) of the audio transmission plug **10** is designed for transmitting the left sound track signals, the second signal transmission unit **104** (the second section) of the audio transmission plug **10** is designed for transmitting the right sound track signals, the third signal transmission unit **106** (the third section) of the audio transmission plug **10** is designed for transmitting the microphone track signals, and the fourth signal transmission unit **108** (the fourth section) of the audio transmission plug **10** is designed for transmitting the ground signals. In this embodiment, neither the wire circuit **1240** shown in FIG. **2**A nor the wire circuit **1242** shown in FIG. **2**B can correctly transmit all kinds of headset signals to the audio output device **14**.

Therefore, the user may directly operate the control part **126** to respectively couple the conductive parts **1260** and **1262** to the two ends of another wire circuit (such as the wire circuit **1244**), which makes each of the signal output ends (**122***a* to **122***d*) of the signal output module **122** receive the correct headset signals for transmitting them to the audio output device **14**.

Please refer to FIG. **2**C which shows a circuit diagram of a headset coupled to still another set of wire circuit according to an embodiment of the present invention. The differences between FIGS. **2**A and **2**C are that in FIG. **2**C, the conductive parts **1260** and **1262** are coupled to the two ends of the wire circuit **1244**. Particularly, the wire circuit **1244** shown in FIG. **2**C has a signal transmission path between the first conductive point of the input end **1244***a* and the firth conductive point of the output end **1244***b*, which makes the left sound track signals of the first signal transmission unit **102** of the audio transmission plug **10** can be directly transmitted to the left speaker transmission end of the audio output device **14**. In addition, a signal transmission path is set between the second conductive point of the input end **1244***a* and the second conductive point of the output end **1244***b;* a signal transmission path is set between the third conductive point of the input end **1244***a* and the fourth conductive point of the output end **1244***b;* and a signal transmission path is set between the fourth conductive point of the input end **1244***a* and the third conductive point of the output end **1244***b*. Thus, all kinds of headset signals may be able to be transmitted to the audio output device **14** correctly.

On the basis of the above, there are just a few differences between the wire circuits **1240** and **1244** which are respectively shown in FIGS. **2**A and **2**C. Particularly, there are just two signal transmission paths been changed. Therefore, the present invention discloses another implementation manner which implements the switching of the aforementioned three types of transmission methods by using a four-to-two switch

(four input signals for switching between two modes) and a two-to-two switch (two input signals for switching between two modes).

[Another Exemplary Embodiment of a Headset According to the Present Invention]

Please refer to FIG. **3**A which shows a circuit diagram of a headset coupled to a set of wire circuit and a set of auxiliary wire circuit according to another embodiment of the present invention. An audio transmission plug **20**, an audio output device **24**, a control part **226**, a signal input module **220**, and a signal output module **222** in this embodiment are similar to their counterparts in the aforementioned embodiment, thus they are not repeatedly described. The differences are that a switch **224** of an inline controller **22** in the present embodiment has only two sets of wire circuits (**2240** and **2242**), and a set of switch **228** and a control part **230** corresponding to the switch **228** are added. The wire circuits **2240** of switch **224** have the same pin relations as the wire circuits **1242**, while the wire circuits **2242** of switch **224** have the same pin relation as the wire circuits **1240**.

Particularly, the control part **230** mechanically links up the conductive parts **2300** and **2302**. Thus, the control part **230** may selectively control the conductive parts **2300** and **2302** to be coupled to the two ends of one of the auxiliary wire circuits **2280** and **2282**. In the auxiliary wire circuits **2280**, a signal transmission path is set between the first conductive point of the input end **2280***a* and the first conductive point of the output end **2280***b*, and a signal transmission path is set between the second conductive point of the input end **2280***a* and the second conductive point of the output end **2280***b*. On the other hand, in the auxiliary wire circuits **2282**, a signal transmission path is set between the first conductive point of the input end **2282***a* and the second conductive point of the output end **2282***b*, and a signal transmission path is set between the second conductive point of the input end **2282***a* and the first conductive point of the output end **2282***b*.

It is worth noting that, for the convenience of descriptions, the wire circuits **2240** are designed to be similar to the wire circuits **1242**, and the wire circuits **2242** are designed to be similar to the wire circuits **1240**. However, the actual pin relations of the wire circuits **2240** and **2242** are not restricted thereby. For example, the one skilled in the art may know that if the pin relations of the auxiliary wire circuits **2280** and **2282** are exchanged, the wire circuits **2242** may also be designed to be similar to the wire circuits **1244**. In addition, in FIG. **3**A, the conductive parts **2260** and **2262** are both movable relative to the switch **224**, and the conductive parts **2300** and **2302** are both movable relative to the switch **228**. However, the control part **226** may actually be able to control only one of the conductive parts **2260** and **2262**, and the control part **230** may actually be able to control only one of the conductive parts **2300** and **2302**.

In this case, FIG. **3**A shows an example that the user directly controls the control part **226** for respectively coupling the conductive parts **2260** and **2262** to the two ends of the wire circuits **2240**, and also controls the control part **230** for respectively coupling the conductive parts **2300** and **2302** to the two ends of the wire circuits **2242**.

It is worth noting that in the present embodiment, the output end **2262***b* of the conductive part **2262** only has the former two conductive points are coupled to the signal output ends (**222***a* to **222***b*), and the latter two conductive points of the output end **2262***b* of the conductive part **2262** are coupled to the two conductive points of the input end **2300***a* of the conductive part **2300**. In addition, the two conductive points of the output end **2300***b* of the conductive part **2300** are respectively coupled to the signal output ends (**222***c* to **222***d*).

Seeing from the aspect of actual operation, when the user uses the manner shown in FIG. **3**A for controlling the control part **226** and control part **230** for respectively conducting the wire circuits **2240** and the auxiliary wire circuits **2280**, the inline controller **22** may actually have the same functionalities as the inline controller **12** in FIG. **2**B. That is, the headset **2** in FIG. **3**A may be used for receiving the headset signals transmitted by the Blackberry mobile phone manufactured by RIM.

Similarly, when the user uses the manner shown in FIG. **3**B for controlling the control part **226** and the control part **230** for respectively conducting the wire circuits **2242** and the auxiliary wire circuits **2280**, the inline controller **22** may actually have the same functionalities as the inline controller **12** in FIG. **2**A. That is the headset **2** in FIG. **3**B may be used for receiving the head set signals transmitted by the mobile phones manufactured by HTC or Apple.

On the other hand, when the user uses the manner shown in FIG. **3**C for controlling the control part **226** and the control part **230** for respectively conducting the wire circuits **2242** and the auxiliary wire circuits **2282**, the inline controller **22** may actually have the same functionalities as the inline controller **12** in FIG. **2**C. That is the headset **2** in FIG. **3**C may be used for receiving the head set signals transmitted by the mobile phones manufactured by Nokia.

Seeing from the aspect of the appearances and structures of the headset, please refer to FIG. **4** which depicts a three dimensional diagram of the headset in FIG. **3**A. As shown in FIG. **4**, the headset **3** has an audio transmission plug **30**, an inline controller **32**, and an audio output device **34**. The audio transmission plug **30** is the same as the audio transmission plug **20** in FIG. **3**A and is not described repeatedly. The audio transmission plug **30**, the inline controller **32**, and the audio output device **34** in FIG. **4** are only for explaining the coupling relations thereof, and the relations of the audio transmission plug **30** and the audio output device **34** connecting to the inline controller **32** are not restricted thereby. For example, under the situation that the functionalities are not influenced, the connections of the audio transmission plug **30** and the audio output device **34** may also be exchanged with each other.

The inline controller **32** is coupled to the audio transmission plug **30** through a signal cable L, and has a first body **320** and a second body **322**. The first body **320** is used for accommodating the components (including switches **224** and **228**) of the inline controller **22** in FIG. **3**A, and the second body **322** is rotatably connected with the first body **320**. In practice, the appearances of the first body **320** and the second body **322** may both be pillar-shaped, for example, a cylinder. When the second body **322** is rotated relative to the first body **320**, the second body **322** is rotated around the extension line of the long axis of the first body **320**. In addition, when the second body **322** is rotated, it may link up one of the control parts **226** and **230** in FIG. **3**A.

Thus, by linking up the control part **226**, the conductive parts **2260** and **2262** may be coupled to one of the wire circuits **2240** or **2242** at the same time. By linking up the control part **230**, the conductive parts **2300** and **2302** may be coupled to the auxiliary wire circuits **2280** or **2282**.

Please refer to FIG. **4**. The inline controller **32** of the headset **3** may further have a microphone **36** and a microphone switch **38**. That is, the audio output device **34** may have only a speaker, and the signal output end **222***d* of the signal output module **222** in FIG. **3**A may be coupled to the microphone **36**, which makes the audio receiving and outputting functions be separated. Seeing from the aspect of actual using, only when the microphone switch **38** is pushed by the

user, the microphone **36** of the headset **3** starts to receive sounds. The one skilled in the art may know the functionalities of the microphone **36** and the microphone switch **38**, thus they are not described repeatedly in the following descriptions.

If the housing of the first body **320** is opened, we may refer to FIG. **5**. As shown in FIG. **5**, when the second body **322** is rotated, it may link up the first linkage part **324**, which makes the first linkage part **324** be rotated in the same speed as the rotating second body **322**. In addition, the second linkage part **326***a* may be linked by the first linkage part **324** and be moved by a displacement d which is parallel to the long axis of the first body **320**. Certainly, there may have a correlation between the rotation angle of the second body **322** and the magnitude of the displacement d. For example, when the second body **322** is rotated by 90 degrees, the second linkage part **326***a* may move toward the second body **322** by a displacement d, and then when the second body **322** is rotated by 90 degrees again (totally 180 degrees), the second linkage part **326***a* may move toward the opposite way by the displacement d (back to the original place). In this case, the present embodiment does not restrict the magnitudes of the rotation angle and the displacement d, and they may be set by one skilled in the art according to actual requirements.

As shown in FIG. **6**, the second linkage part **326***a* may actually be used for controlling the third linkage part **328***a* of the switch **330***a*. When seeing the switch **330***a* as the switch **224** in the FIG. **3**A, the third linkage part **328***a* may be used for linking up the conductive parts **2260** and **2262**. In other words, the combination of the second body **322**, the first linkage part **324**, the second linkage part **326***a*, and the third linkage part **328***a* may serve as the control part **226** in FIG. **3**A, and the user may switch the switch **224** by rotating the second body **322**. The displacement d may be the actual distance that the conductive parts **2260** and **2262** changing from the wire circuits **2240** to **2242**. If there are three wire circuits as shown in FIG. **2**A, the distance between two of the wire circuits may be half of the displacement d, which makes displacements 0, 0.5d, and d be corresponded to the three wire circuits.

As shown in FIG. **3**A, the present invention may have not only one set of switch **330***a*, but also another set of switch **330***b* (in FIG. **7**, it may be corresponded to the switch **228** in FIG. **3**A) which is similar to the switch **330***a*. Please refer to FIG. **7**. Seeing from the side view of the headset **3**, if only the set of switch **330***a* (and the second linkage part **326***a* and the third linkage part **328***a* linked up with the switch **330***a*), another set of switch **330***b* (and the second linkage part **326***b* and the third linkage part **328***b* linked up with the switch **330***b*), and the substrate **38** used for disposing the switches **330***a* and **330***b* are kept, the relations between the switches **330***a* and **330***b* may be seen.

Please refer to FIGS. **6** and **7**. Seeing from the aspect of actual operation, the first linkage part **324** may be properly designed for selectively linking up the second linkage parts **326***a* or **326***b*, or both. For example, when the user rotates the second body **322** by 90 degrees clockwise, the second linkage part **326***a* may be linked up through the first linkage part **324**, and when the user rotates the second body by 90 degrees counterclockwise, the second linkage part **326***b* may be linked through the first linkage part **324**. The user may be able to rotate the second body **322** according to the manufacturer of the mobile phone, for making all of the headset signals of the audio transmission plug **30** be transmitted and received correctly between the audio output device **34** (or microphone **36**) and the mobile phone.

Although the aforementioned embodiment uses the operation of rotating the second body **322** for linking up the third linkage part **328***a* to move, the implementation is not limited thereby. For example, the second body **322**, the first linkage part **324**, and the second linkage part **326***b* may all be ignored, as long as the third linkage part **328***a* is exposed out of the housing of the first body **320** and can be operated directly by the user. In other words, when the user is using the headset **3**, he or she may operate the third linkage **328***a* in a linear direction and makes the third linkage part **328***a* move by a displacement d, rather than rotates the second body **322**, for achieving the purpose of switching the wire circuits in the switch **330***a*. Although the present embodiment uses rotation and linear operations as examples, the one skilled in the art may know that the user may use moving, sliding, pushing, or other proper operations for controlling the components of the inline controller **32**, which allows the components to make the third linkage part **328***a* to move by a displacement d. That is, the scope of the present invention is not restricted thereby.

In the light of the operation manners of the third linkage part **328***a* and the switch **330***a*, please refer to FIGS. **8**A and **8**B together. FIG. **8**A shows a schematic structure diagram of the third linkage part and the switch according to an embodiment of the present invention, and FIG. **8**B shows another schematic structure diagram of the third linkage part and the switch according to an embodiment of the present invention. As shown in the figures, if the switch **330***a* is separated into several parts, we may see that the third linkage part **328***a* can simultaneously link up four metal chunks (**40**, **42**, **44**, and **46**), and the four metal chunks may serve as the conductive part **2260** (or **2262**) in FIG. **3**A. The switch **330***a* may have twelve conductive pins (P**1** to P**12**). The conductive pins (P**1** to P**4**) may respectively connect with the signal output ends (**220***a* to **220***d*) of the signal input module **220** of FIG. **3**A, for receiving the headset signals transmitted from the audio transmission plug **30**. On the other hand, the conductive pins P**5**, P**7**, P**9**, and P**11** may respectively connect with the input end **2240***a* of the wire circuits **2240** in the FIG. **3**A, and the conductive pins P**6**, P**8**, P**10**, and P**12** may respectively connect to the input ends **2242***a* of the wire circuits **2242** in FIG. **3**A.

When the third linkage part **328***a* is at the position shown in FIG. **8**A, the conductive pins P**1** to P**4** may respectively be coupled to the conductive pins P**5**, P**7**, P**9**, and P**11** through the metal chunks **40**, **42**, **44**, and **46**, and when the third linkage part **328***a* is at the position shown in FIG. **8**B, the conductive pins P**1** to P**4** may be respectively coupled to the conductive pins P**6**, P**8**, P**10**, and P**12** through the metal chunks **40**, **42**, **44**, and **46**. By doing this, the structures shown in FIGS. **8**A and **8**B may be used as examples for implementing the conductive part **2260** in FIG. **3**A for switching the wire circuits **2240** and **2242**. As long as the conductive pins are connected to the proper input ends or output ends, the other conductive parts in the present invention may switch the corresponding wire circuits by using similar manners as in FIGS. **8**A and **8**B, and implementations of the manners are not restricted by the present invention.

Because the second body **322** of the inline controller **32** in FIG. **4** may be able to be mechanically rotated, thus each of the linkage parts may carry considerable forces. The second body **322** is not suitable to be integrated with the audio transmission plug **30**. Because the audio transmission plug **30** needs to be pulled and plugged frequently, if the inline controller **32** is integrated with the audio transmission plug **30**, the mechanical components may be damaged quickly. There may need a signal cable L between the audio transmission plug **30** and the inline controller **32**, for reducing the forces

transmitted to the inline controller **32** when pulling or plugging the audio transmission plug **30**.

On the basis of the above, the audio transmission lines and the headsets disclosed by the embodiments of the present invention have several sets of wire circuits, and each of them has different predetermined pin connection relationships. The user may mechanically switch different wire circuits through control parts according to different standards and specifications of the electrical devices, for making the headset signals transmitted by the audio transmission plug be received by the headset correctly. Without using the IC chip, the present invention may be able to solve the aforementioned problem of the transmission orders.

Some modifications of these examples, as well as other possibilities will, on reading or having read this description, or having comprehended these examples, will occur to those skilled in the art. Such modifications and variations are comprehended within this disclosure as described here and claimed below. The description above illustrates only a relative few specific embodiments and examples of the present disclosure. The present disclosure, indeed, does include various modifications and variations made to the structures and operations described herein, which still fall within the scope of the present disclosure as defined in the following claims

What is claimed is:

1. An audio transmission line, comprising:

an audio transmission plug for being coupled to an electrical device, and having a plurality of signal transmission units for transmitting a plurality of headset signals, each of the signal transmission units transmitting one of the headset signals; and

an inline controller coupled to the audio transmission plug through a signal cable, including:

a signal input module having a plurality of signal input ends, each of the signal input ends being coupled to one of the signal transmission units in an one-to-one fashion;

a signal output module having a plurality of signal output ends;

a first control part mechanically linking up at least one first conductive part or one second conductive part, input ends of the first conductive part being coupled to the signal input ends, and output ends of the second conductive part being coupled to the signal output ends; and

a plurality of wire circuits, a predetermined pin connection relationship being provided between input ends and output ends of each of the wire circuits, and the predetermined pin connection relationships of different wire circuits being different from one another;

wherein the first control part selectively at least controls the output ends of the first conductive part for coupling to the input ends of one of the wire circuits, or controls the input ends of the second conductive part for coupling to the output ends of the same wire circuit.

2. The audio transmission line according to claim **1**, wherein the first control part shifts by a displacement corresponding to a rotary operation.

3. The audio transmission line according to claim **1**, wherein the first control part shifts by a displacement corresponding to a rectilinear operation.

4. The audio transmission line according to claim **1**, wherein the inline controller has a first body and a second body, the first body is used for accommodating a first switch, the wire circuits are formed on the first switch, and the second body is rotatably connected with the first body; when the second body is rotated relative to the first body, the second body links up the first control part for controlling the first conductive part and the second conductive part simultaneously to couple to one of the wire circuits.

5. The audio transmission line according to claim **1**, wherein the inline controller further includes:

a second control part mechanically linking up a third conductive part and a fourth conductive part, input ends of the third conductive part is coupled to part of the output ends of the second conductive part, and output ends of the fourth conductive part is coupled to part of the signal output ends; and

a second switch coupled between the third conductive part and the fourth conductive part and having a plurality of auxiliary wire circuits, wherein an predetermined auxiliary pin connection relationship is provided between input ends and output ends of each of the auxiliary wire circuits, and the predetermined auxiliary pin connection relationships of different auxiliary wire circuits are different from one another;

wherein the second control part selectively controls the output ends of the third conductive part for coupling to the input ends of one of the auxiliary wire circuits, and controls the input ends of the fourth conductive part for coupling to the output ends of the same auxiliary wire circuit.

6. The audio transmission line according to claim **5**, wherein the inline controller has a first body and a second body, the first body is used for accommodating the first switch and the second switch, and the second body is rotatably connected with the first body; when the second body is rotated relative to the first body, the second body links up at least the first control part or the second control part, and at least allows the first control part to control the first conductive part and the second conductive part for simultaneously coupling to one of the wire circuits, or allows the second control part to control the third conductive part and the fourth conductive part for simultaneously coupling to one of the auxiliary wire circuits.

7. The audio transmission line according to claim **6**, wherein the second body of the inline controller rotates around an extension line of a long axis of the first body.

8. A headset, comprising:

an audio transmission plug for being coupled to an electrical device, and having a plurality of signal transmission units for transmitting a plurality of headset signals, each of the signal transmission units transmitting one of the headset signals;

an inline controller coupled to the audio transmission plug through a signal cable, including:

a signal input module having a plurality of signal input ends, each of the signal input ends being coupled to one of the signal transmission units in an one-to-one fashion;

a signal output module having a plurality of signal output ends;

a first control part mechanically linking up at least a first conductive part or a second conductive part, input ends of the first conductive part being coupled to the signal inputs, and output ends of the second conductive part being coupled to the signal output ends; and

a plurality of wire circuits, a predetermined pin connection relationships being provided between input ends and output ends of each of the wire circuits, and the predetermined pin connection relationships of different wire circuits being different from one another; and

an audio output device coupled to the signal output module, for generating sounds corresponding to a sequence of the headset signals outputted by the signal output ends;

wherein the first control part selectively at least controls the output ends of the first conductive part for coupling to the input end of one of the wire circuits, or controls the input ends of the second conductive part for coupling to the output ends of the same wire circuit.

9. The headset according to claim **8**, wherein the inline controller has a first body and a second body, the first body is used for accommodating a first switch, the wire circuits are formed on the first switch, and the second body is rotatably connected with the first body; when the second body is rotated relative to the first body, the second body links up the first control part for controlling the first conductive part and the second conductive part simultaneously to couple to one of the wire circuits.

10. The headset according to claim **8**, wherein the inline controller further includes:

a second control part mechanically linking up a third conductive part and a fourth conductive part, input ends of the third conductive part is coupled to part of the output ends of the second conductive part, and output ends of the fourth conductive part is coupled to part of the signal output ends; and

a second switch coupled between the third conductive part and the fourth conductive part and having a plurality of auxiliary wire circuits, wherein an predetermined auxiliary pin connection relationships is provided between input ends and output ends of each of the auxiliary wire circuits, and the predetermined auxiliary pin connection relationships of different auxiliary wire circuits are different from one another;

wherein the second control part selectively controls the output end of the third conductive part for coupling to the input ends of one of the auxiliary wire circuits, and controls the input ends of the fourth conductive part for coupling to the output ends of the same auxiliary wire circuit.

11. The headset according to claim **10**, wherein the inline controller has a first body and a second body, the first body is used for accommodating the first switch and the second switch, and the second body is rotatably connected with the first body; when the second body is rotated relative to the first body, the second body links up at least the first control part or the second control part, and at least allows the first control part to control the first conductive part and the second conductive part for simultaneously coupling to one of the wire circuits, or allows the second control part to control the third conductive part and the fourth conductive part for simultaneously coupling to one of the auxiliary wire circuits.

12. The headset according to claim **11**, wherein the second body of the inline controller rotates around an extension line of a long axis of the first body.

* * * * *